**T03D01 – Periodicity I**

Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Arrange the members of the following groups of elements in order of **increasing** atomic radius.

a. Na, Mg, Al, Si, S b. Ga, Ge, As, Sb, Br

............................. .............................

c. O,Br,Cl,F,I.Ne d. Si, Sn, C, Pb, Ge

............................. .............................

2. Arrange the members of the following groups of elements in order of **increasing** first ionization energy.

a. N, P, As, Sb, Bi b. Li, Be, B, C, N, O, F

............................. .............................

c. Ca, Ba, Mg, Be, Sr d. Ba, Cs, Pb, Po, Tl

............................. .............................

3. Arrange the members of the following groups of elements in order of **increasing** electronegativity.

a. Na, Mg, Al, Si, S, Cl b. C, Si, Ge, Sn, Pb

............................. .............................

c. Ge, Ga, Ca, K, Br d. I, Sn, Te, Sb, Sr

............................. .............................

4. Three elements are represented by the letters A, B, and C. The three elements have the same number of valence electrons. Element A has electrons in three energy levels and element C is the lightest of the three. Element B has a total of 19 electrons.  **Identify** the elements.

5. Fill in the symbol of the element that **BEST** fits each of the following:

a. most reactive in family IA (1) ..............

b. most reactive in family VIIB (17) ...............

c. most metallic in family IIA (2) ...............

d. most metallic in family IVB (14) ...............

e. smallest radius in period 3 ...............

f. most nonmetallic in period 4 ...............

g. highest ionization energy in period 5 ...............

h. highest ionization energy in family VIB (16) ...............

i. highest electronegativity in period 2 ...............

j. most metallic element family VIIB (17) ...............

k. element with the least likely-hood to combine ...............

l. element with the lowest electronegativity? .......………

m. element with the lowest ionization energy? ........……..

6. Arrange the elements K, As and Br in order of

a. increasing atomic radius. .....................................

b. increasing ionization energy. .....................................

c. increasing metallic character. ......................................

7. Which of the four atoms Ca, As, Br or Rb has the

a. largest atomic radius. ...............

b. highest ionization energy. ...............

c. least metallic character. ...............

d. highest electronegativity. ...............

8. How many electrons are there in the **valence shells** of each of the following:

a. N b. N3- c. O d. O-2 e. Al+3

a................ b................ c............... d............... e................

Which of the ones above are **isoelectronic?**

9. In some versions of the periodic table hydrogen is placed at the top of Group VIIB rather than at the top of Group IA. Justify this location.

10. Answer the following questions about the elements A and B, which have these electron configurations:

A = ....4p65s1  B= ......3p6d104s24p4

a. Is element A a metal, nonmetal or metalloid? . ..............

b. Which element would have the greater ionization energy? ...............

c. Which element should have the more electronegativity? ..............

d. Which element has larger atoms? ...............

11. **Name the element** corresponding to each of the following characteristics:

a. The element with the electron configuration 1s22s22p63s23p4. ...............

b. The element in the alkaline earth metals that has the largest atomic .....………

radius

c. The element in group VB [15] that has the largest ionization energy …………

d. The element whose +2 ion has the configuration [Kr]4d6. ...............

e. The element with the lowest electronegativity in group VIIB (17) . ............

f. The element whose electron configuration is [Ar]3d104s1. ...............

12. Suppose a new element, tentatively given the symbol Et, has just been discovered. Its atomic number is 113.

a. Depict the electron configuration of the element using spectroscopic notation

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b. Name another element that you would expect to find in the same group as Et. ...............

c. Give the formulas of the compounds of Et formed with O and then Et with Cl.

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13. What is the trend in size for N, O and F? ...............

What is the trend in size for N3- O2-, and F-? ...............

Are the answers the same in each case or different? Explain.

14. Tell what happens to atomic size, ionization energy, and electronegativity when proceeding across a period, and down a group. **Explain**.

15. Select the larger member of each pair.

a. Sc and Sc+3 ............... b. O and O-2 ...............

c. Ba2+ and Ba ............... d. N and N-3 ...............

16. List the species in order of decreasing radius:

a. C, C+4,N, O, O-2 ...................................

b. Al, Al+3 , Si , P-3 ...................................

c. Cs, Cs+1, Rb ....................................

17. Arrange the members of the following groups in order of increasing ionic radii.

a. F-1, Cl-1, Br-1, I-1, At-1 b. Co +2, Co +3

............................. .............................

18. What contributions did each of the following do for the periodic table?

a. Dimtri Mendeleev

b. Ernest Rutherford

c. John Dalton

d. Johann Dobereiner

e. John Newlands

19. Define the following terms:

a. main group (representative) elements

b. outer transition elements

c. inner transition elements

20. Indicate whether each trends increases, decreases or remains the same across a period.

a. radius ............................

b. ionization energy ............................

c. electron affinity ............................

d. electronegativity ............................

e. non-metallic properties ............................

21. Indicate whether each trend increases, decreases or remains the same down a group or family.

a. radius ............................

b. ionization energy ............................

c. electron affinity ............................

d. electronegativity ............................

e. non-metallic properties ............................

22. Define the following terms:

a. cation

b. anion

How does the size of an anion compare to the size of the atom it came from?

How does the size of a cation compare to the size of the atom it came from?